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ABSTRACT

A labor force study ascertained the current and projected needs for the training of computer-integrated manufacturing (CIM) technicians and provided that information to administrators, faculty, and industrial advisors. Findings were that a decrease in the number of young people (24 years old and younger) was accompanied by a significant increase in the 35- to 49-year-old group. Educational attainments of adults were below state averages. A relatively substantial work force was employed in manufacturing industries, many where application of modern manufacturing methods are pertinent. Projections indicated a 30 percent growth for engineering technicians and technologists. The Indiana Commission for Higher Education favored expansion of needed programs in Southern Indiana and recognized the need for more technicians who can continue their studies to the baccalaureate level. A minimum annual recurring training requirement was calculated to be for 14 graduates as new labor force entrants into all types of manufacturing industries, plus related training needs for at least 15 adults now in the work force. Recommendations were for authorization to grant the CIM technology associate degree, adult continuing education and service courses to meet the CIM technology training needs, organization of an industrial advisory committee, and liaison with local high schools. (YLB)

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MANPOWER AND EDUCATIONAL REQUIREMENTS FOR COMPUTER INTEGRATED MANUFACTURING TECHNICIANS IN THE COLUMBUS, INDIANA REGION

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COLUMBUS REPORT 86-3
DATE: 30 APRIL 1986

Office of Manpower Studies
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MANPOWER AND EDUCATIONAL REQUIREMENTS FOR COMPUTER INTEGRATED MANUFACTURING TECHNICIANS IN REGION 11
(THE COLUMBUS, INDIANA AREA)

FOREWORD

This manpower study is designed to determine whether or not a Purdue University associate degree program in Computer Integrated Manufacturing Technology (CIMT) is needed in Region 11. (This Southeast-Central Indiana Region is made up of Bartholomew, Brown, Decatur, Jackson and Jennings Counties.) Data were acquired through surveys sent to manufacturing firms, and from computations of requirements based on factors and ratios gleaned from previous research. Indications of the degree of local interest and support for a CIMT program were also obtained.

According to the editorial in the Spring 1986 Journal of Engineering Technology (Vol. 3, No. 1),

> ***...engineering technology education makes a contribution which consists of three parts: (1) It improves the quality of life; (2) It develops the economy; and (3) It provides a means for a wide cross section of people to share in both the improved quality of life and the improved economy. That third point is most important because its inclusion is more or less unique to engineering technology...***

ACKNOWLEDGEMENTS

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Ms. Edith M. Sweeney, Secretary to Dr. Bippen

Dr. Don K. Gentry, Director
Purdue Statewide Technology Program

Ms. Rebecca Stanley, Branch Manager, SE District
Employment Security Division, Columbus, IN.

ALSO

Appreciation is expressed to the representatives of Region 11 manufacturing firms who responded to the survey to determine needs for the CIMT programs, and to the organizations, officials, and others who responded to the survey or otherwise provided advice and assistance.

Special thanks to Dr. Kevin D. Shell, whose computations and data analyses comprise an important part of this study.

J. P. Lisack

Dr. J. P. Lisack, Director
Office of Manpower Studies

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(THE COLUMBUS, INDIANA AREA)

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MANPOWER AND EDUCATIONAL REQUIREMENTS FOR COMPUTER INTEGRATED MANUFACTURING TECHNICIANS IN REGION 11
(THE COLUMBUS, INDIANA AREA)

1. PURPOSE OF THIS REPORT

Two manpower studies were completed in 1984 to identify the technology-type programs needed in Region 11.[1/] As a result of these studies, Electrical Engineering Technology and Computer Technology two-year associate degree programs were started. These two programs are designed to train new engineering technicians and programmers and to upgrade and retrain adults now in the workforce throughout Region 11. The manpower needs assessments in these previous reports identified another emerging technical training requirement--namely for computer integrated manufacturing technicians.

There is an urgency for American manufacturing firms to increase productivity, raise quality of product and lower costs in order to meet increasing competition from abroad. Accordingly, this manpower report is designed to ascertain the current and projected needs for the training of computer integrated manufacturing technicians in this region. Hopefully, it will assist administrators, faculty and industrial advisors to decide what should be done to assure that training new technician-level personnel and upgrading or retraining adults in the manufacturing workforce in particular will meet identified needs.

2. BACKGROUND

A. Demographics: Region 11 and Internal Counties

The 1980 population of the five counties making up Economic Region 11 was 160,683 and grew to 161,400 by July 1st, 1984 (a slight increase of 0.4%). This projected increase compares with a smaller increase for the total population of Indiana during this same period. Bartholomew County has the largest population in this region, but it decreased approximately 1.0 percent (to a 64,400 people) between 1980 and 1984 (see Table 1).

1/ A Manpower Study Justifying the Needs for an Associate Degree Program in Computer Technology at the Indiana University-Purdue University-Indianapolis, Columbus Campus (Manpower Report 84-1.) 11 April 1984.
A Manpower Study Verifying the Needs for an Associate Degree Program in Electrical Engineering Technology at the Indiana University-Purdue University-Indianapolis, Columbus Campus (Manpower Report 84-9.) 1 October 1984.

TABLE 1

POPULATIONS: INDIANA, REGION 11, AND INTERNAL COUNTIES 1980 - 1984

State & County	April 1 1980 (Census)*	July 1 1984 (Estim.)**	Change 1980 - 1984 Number	Percent
Indiana	5,490,212	5,498,000	7,788	0.1%
Bartholomew	65,088	64,400	- 688	-1.0
Brown	12,377	12,500	123	0.8
Decatur	23,841	24,000	159	0.8
Jackson	36,523	37,700	1,177	3.1
Jennings	22,854	22,800	- 54	-0.4
Region 11	160,683	161,400	+ 717	0.4

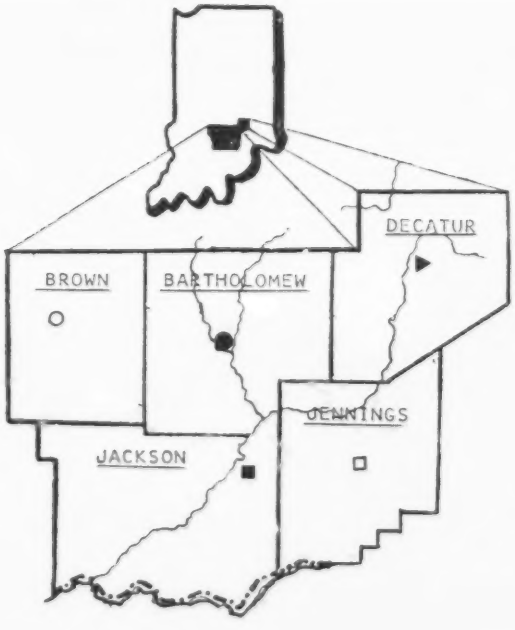
SOURCES:

*1980 U.S. Census, 1983 Population Report.

**Estimate by the U.S. Census Bureau, as of 1 July, 1985, Indiana University, Div. of Research, School of Business, and the Indiana State Board of Health.

NOTE: The largest city in this region by far, is Columbus which had a population of more than 30,000 in 1980.

County	Name	Key City Population
BARTHOLOMEW	● COLUMBUS	30,292
BROWN	○ NASHVILLE	705
DECATUR	▶ GREENSBURG	9,254
JACKSON	■ SEYMOUR	15,050
JENNINGS	□ N. VERNON	5,768



It is important to note that in Region 11 (not unlike the State as a whole) there is a projected decrease in the number of younger people in the population and an increase in the number of people aged 35 or older. Region 11 distributions of population by age group for 1980 and the year 2000 are shown in Table 2.

TABLE 2

REGION 11
POPULATION AGE STRUCTURE: 1980-2000

Age Groups	1980	2000	Number Change in Population	Percentage Change in Population
0- 4	12,510	11,460	- 1,050	- 8.4%
5-14	28,040	23,990	- 4,050	- 14.4%
15-19	14,630	11,970	- 2,660	- 18.2%
20-24	13,110	11,830	- 1,280	- 9.8%
25-34	25,810	25,520	- 290	- 1.1%
35-49	27,920	41,140	+ 13,220	+ 47.3%
50-64	21,920	31,120	+ 9,200	+ 42.0%
65+	16,810	23,450	+ 6,640	+ 39.5%
TOTAL	160,700	180,600	+ 19,900	+ 12.4%

SOURCES: Indiana University, Division of Research, School of Business--and the Indiana State Board of Health. Population Projection Report - 1983.

Of great significance to educational planners -- and employers -- are the above projections showing a continuing decline of younger people (age 24 and below) and an increase of older people. This phenomenon is reflected in the steady rise of the median age of the population.

MEDIAN AGE	
1980	28.7
1985	30.4
1990	31.9
1995	33.3
2000	34.7

B. Educational Attainment of Adults in Region 11

There is evidence that, in general, the higher the educational level, (1) the higher the salary or wage earned, (2) the lower the unemployment rate, (3) the better the career progression, and (4) the less time and money it takes to retrain or upgrade, as well as other advantages. A quality work force is a valuable asset to employers and to the community and is a critical element to meet competition in order to survive, or to grow. Unfortunately, the educational attainments of adults in Indiana are lower than national averages. Significant to this study is the fact that the educational attainments of adults in Region 11 are well below Indiana averages (see Table 3).

TABLE 3

EDUCATIONAL ATTAINMENT COMPARISONS FOR ADULTS 25 YEARS AND OLDER (% DISTRIBUTION): NATIONAL, INDIANA AND REGION 11

	Highest Educational Level Attained						
	Elementary	High School		College			Adult
	0-8	1-3	4	1-3	≥4	Totals	Population
NATIONAL	18.4%	15.3%	34.4%	15.7%	16.3%	100%	132,775,652
INDIANA	16.6%	17.1%	41.7%	12.1%	12.5%	100%	3,135,772
Region 11	19.5%	16.5%	42.7%	10.3%	11.0%	100%	94,435
Bartholomew	16.8	14.7	41.7	12.0	14.8	100%	37,546
Brown	15.7	17.7	37.7	14.6	14.3	100%	7,462
Decatur	21.3	17.1	45.4	8.1	8.1	100%	13,411
Jackson	22.5	17.7	44.0	8.4	7.4	100%	21,244
Jennings	23.1	18.8	43.2	8.1	6.8	100%	12,772

SOURCE: 1980 Census Data

NOTE: The changing composition of the population (fewer young people and more middle-aged and older people), and the educational attainment of adults are very important considerations in the planning of educational/training programs. Also, pertinent is that previous research show the rank order of main reasons why people choose to go to a certain college is:

1st Offers what I want to study
2nd Program is available locally
3rd Good academic reputation
4th Low tuition
5th+ All other reasons.

It follows then, that it is important to identify the educational courses and programs that are needed and wanted, to offer them locally by an institution with a good academic reputation, and to keep costs as reasonable as possible.

C. Workforce in Region 11

(1) Employment:

Nearly 55,300 people working in 2,900 firms covered by the Indiana Employment Security Division (IESD) system are employed in Region 11. This represents about 95% of all employees (excluded are the self-employed, small farms, and very small businesses). Employment data are shown by major industrial divisions and sub-divisions in Table 4. The largest number of employees are shown in the manufacture of machinery. This sub-division is undergoing major changes in modernization of production systems and processes, which makes a CIMT program more appropriate over time.

The majority of employees in Region 11 work in Bartholomew County (Columbus is the key city). More than two-thirds of all employees in manufacturing firms in Region 11 work in Columbus.

TABLE 4

EMPLOYMENT IN REGION 11
BY INDUSTRIAL DIVISION AND SUB-DIVISIONS*
(1ST HALF, 1984)

Major Industrial Divisions and Larger Sub-Divisions	Sub-Division Employment: No. of Employees	Sub-Division Employment: % Total Division Employed	Sub-Division Employment: No. of Firms	Sub-Division Employment: % Total Division Firms	Division Employment: No. of Employees	Division Employment: % Total Region Employed	Division Employment: No. of Firms	Division Employment: % Total Region Firms
▷Agriculture					534	1.0%	54	1.8%
▷Mining					133	.2%	12	.4%
▷Construction					1,278	2.3%	290	9.9%
▷Manufacturing					23,948	43.3%	247	8.5%
Food & Kindred Products	1,231	5.1%	18	7.3%				
Apparel & Fabric Products	629	2.6%	5	2.0%				
Furniture & Fixtures	932	3.9%	4	1.6%				
Paper & Allied Products	944	3.9%	9	3.6%				
Rubber & Plastics	1,781	7.4%	15	6.1%				
Fabr. Metal Products	1,795	7.5%	22	8.9%				
Machinery	11,610	48.5%	67	27.1%				
Electr. Mach., Equipment & Supplies	787	3.3%	4	1.6%				
Transportation Equipment	2,155	9.0%	7	2.8%				
▷Transportation, Communication & Utility					2,270	4.1%	132	4.5%
Motor Frt. Trans. & Warehousing	752	33.1%	73	55.3%				
Communication	453	20.0%	13	9.8%				
Utilities	505	22.2%	19	14.4%				
▷Wholesale Trade					1,851	3.3%	207	7.1%
Durable Goods	819	44.2%	117	56.5%				
Nondurable Goods	1,032	55.8%	90	43.5%				
▷Retail Trade					9,223	16.7%	842	28.8%
General Merchandise Stores	1,022	11.1%	35	4.2%				
Food Stores	1,580	17.1%	85	10.1%				
Auto Dealers & Gas Service Stations	1,084	11.8%	151	17.9%				
Restaurants & Bars	3,453	37.4%	203	24.1%				
▷Finance, Insurance, & Real Estate					1,762	3.2%	217	7.4%
Banking	750	42.6%	13	6.0%				
▷Services					11,838	21.4%	750	25.7%
Hotels & Other Lodging	774	6.5%	32	4.3%				
Health Services	4,721	39.9%	196	26.1%				
Educational Services	3,353	28.3%	14	1.9%				
Social Services	568	4.8%	25	3.3%				
▷Public Administration					2,457	4.4%	169	5.8%
State Public Administration	594	24.2%	74	43.8%				
Local Public Administration	1,721	70.0%	73	43.2%				
▶Total Region 11					55,294	100%	2,920	100%

* *Includes only employment covered by the Indiana Employment Security Division*

(2) Working Patterns in Region 11

More than 53,000 adults lived and worked within Region 11 according to the 1980 Census, and there was also a net in-migration of more than 600 workers. Of this region's resident workers, 42 percent were in Bartholomew County, which served as the employment center for the region. Bartholomew County also had a net in-migration of more than 5,000 workers, drawing workers from all the other counties in Region 11.

See Attachment 1 for Working Patterns Map and details of working migration.

3. NATIONAL PROJECTIONS FOR SELECTED OCCUPATIONS

Growing needs for training engineering technicians are not unique to Region 11. They are also needed throughout the State of Indiana and for the nation. The dynamic growth expected for the electrical/electronics and mechanical engitechnicians and for computer programmers corroborate previous decisions to implement the electrical and mechanical engineering technology and computer technology programs in Region 11. Related impressive projected growth rates are shown in Table 5. According to recent projections of the Bureau of Labor Statistics, there are significant growth trend differences for many occupations. For other comparisons, see Attachment 2.

TABLE 5

SELECTED TECHNICAL OCCUPATIONAL EMPLOYMENT CHANGES
PROJECTED FROM 1984 TO 1995 (NATIONAL DATA)*

	Employment 1984	Employment 1995	% Change 1984-95
	(#'s in Thousands)		
ALL OCCUPATIONS	106,843	122,760	15%
Computer Specialist	699	1,180	69%
Systems Analysts	308	520	69%
Computer Programmers	341	586	72%
Data Process, Equip., Repair	50	74	56%
Engineers (All types)	1,331	1,811	36%
Aero & Astro	48	62	30%
Chemical	56	69	24%
Civil	175	222	27%
Electrical & Electronic	390	597	53%
Industrial	125	162	29%
Mechanical	237	317	34%
Engineering Technicians & Technologists	557	790	42%
Civil	71	74	28%
Electrical & Electronic	404	607	50%
Industrial	27	34	26%
Mechanical	55	75	37%
Drafters	345	384	11%

SOURCE: Monthly Labor Review, November 1985, U. S. Department of Labor, Bureau of Labor Statistics, Washington, D. C. 20212.

The positive impact of high technology on the growth of engineer, technologist and technician occupations, as well as computer specialists is noteworthy. However, the advances in computer-aided drafting and design technology are expected to limit and focus the employment growth of drafters. Of importance is not only the higher growth anticipated in technical jobs, but also the fact that many current employees will require extensive upgrade training to become proficient in a modernized setting. This is particularly true as computerized manufacturing automation is implemented.

4. INDIANA COMMISSION FOR HIGHER EDUCATION (ICHE)

The Commission has prepared statistical profiles for four large regions within the State to serve as background information to assist in analyses of educational needs and to help determine related recommendations. The ICHE region pertinent to this study was called the "Southern Region". This large region encompasses five Economic Regions, including Economic Region 11, which is the subject of this manpower report.

Based on the review of statistical data, the Commission's staff identified findings and recommendations for each region, and reported the following selected extracts*:

D. Activities at Columbus...

1. The IUPUI-Columbus Center

STATE OF INDIANA
COMMISSION FOR HIGHER EDUCATION

BACKGROUND

The Columbus community should be applauded for the support it has shown for post-high school education. In many ways, it has become a model in community support and planning.

RECOMMENDATION

...IU should be encouraged to expand needed programming in Columbus by means of contracts with other institutions, such as Purdue programs made available through the Statewide Technology Program, and via the use of technology and telecommunications. Furthermore, data reporting enrollments, costs, equipment, facilities, and other activities at the Columbus Center should be provided by IU to the state as a matter of routine. The Commission recommends that the Columbus delivery site become a third budget line associated with IUPUI in addition to existing budget lines for IUPUI-Health and IUPUI-NonHealth.

By making the Columbus Center more visibly a delivery site for programs initiated and suported by IU, and other institutions which might serve the region from this base, the Commission expects that the range and quality of services delivered at the Columbus Center can be both widened and strengthened. By making activities at the Columbus Center more visible at the state level, enrollments and regional demand for services can be tracked and new levels of state and institutional commitments, and local program authority, can be considered when conditions warrant it....

Moreover, in the Commission's latest Annual Report to the governor (March 1986), Section III, "Special Planning Initiatives" states the following:

Indiana's manufacturing industries, which are hiring more and more at the technician level, are projecting that technician training will have to be upgraded to the bachelor's level within five years. Another essential educational task is the upgrading of current members of the workforce.

The change in job requirements and workforce preparation that ha already taken place can be seen by comparing the U.S. labor force at two points in time. In 1952, 8% of the total U.S. workforce had four years or more of college. This percentage had grown to 19% by 1980. By contrast, only 12.4% of Indiana's workforce are estimated to have a college degree. One reason for the contrast is Indiana's apparently low college participation rate. At present, it is estimated that less than half of the state's high school graduates continue on to college, a rate that is below both midwestern and national averages.

This manpower study is in direct support of the Commission's initiative statement. It addresses the need to provide technicians trained in computerized manufacturing automation. Further, the two-year CIMT program articulates with a number of baccalaureate degrees and is designed to prepare recent high school graduates for viable careers in manufacturing firms, as well as to upgrade current members of the workforce.

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*Indiana Commission for Higher Education, "Report on Needs and Opportunities for Higher Education in Southern Indiana" (Executive Summary), Nov. 11, 1983.

5. METHODOLOGY OF COMPUTING TECHNICAL MANPOWER AND PROGRAM NEEDS

A. Manpower Needs

The techniques applied involve the following steps. First, a determination must be made by Standard Industrial Classification (SIC) Code of all of the various manufacturing and service firms which previous studies have indicated employ persons trained in technical programs. The second step is to make a listing of all the firms by appropriate SIC Code and size of employment in the counties under study. (The numbers of employees in each selected SIC manufacturing group in Region 11 and internal counties is presented in Table 4 on page 5.)

Third, a determination is made of the proportion of employees in these firms that are employed in occupations with skills and qualifications applicable to technology-type training programs. These occupational distribution factors come from a manpower study made by the U.S. Department of Labor which identified every occupation normally found in each type (classification) of industry in Indiana. The study results are reported in the OES*. The OES report presents the percentage of people in each occupation normally found within each type of industry. For example, a certain percent of a given type of manufacturing firm's employees are made up of specific types of engineers, technicians, clerks, draftmen, tool-and-die makers, machinists, etc. By applying the employee percentage factor for each pertinent occupation that is related to technology programs, one can compute the numbers and types of technicians normally employed in each industry in a particular geographic area. After the proportional numbers of employees in each type of occupation under study are determined, the next step is to apply the normal attrition and turnover factors for that occupation and determine the anticipated changes due to growth or workforce reduction.

All these data are then used to calculate the annual recurring requirements for new personnel in each occupation. Adjustments are made according to recommendations of labor analysts in the State Research and Statistics office of the Indiana Employment Security Division, survey results, advice from industrialists, previous studies and experience.

Finally, the requirement for upgrading and retraining adults now in the workforce must be determined. These are critical data because of a growing proportion of adults aged 35 to 49, whose educational attainment levels are relatively low, and because of continuously changing technological requirements. Educational programs are justified not only because there probably are adequate job opportunities for new graduates, but also because there are current and future needs for the continuing education of adults.

B. Review and Corroboration

It is necessary to corroborate the calculated training requirements through special surveys, interviews, and opinions of representatives from appropriate industries. This has been done, with the results reported in the next section. Letters of endorsement and support are attached.

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*Occupational Employment Statistics. Staffing Patterns in the Manufacturing Industries in Indiana: 1977 and as revised. Research and Statistics Section, Indiana Employment Security Division and U.S. Department of Labor, February 1980.

6. ANNUAL RECURRING REQUIREMENTS FOR COMPUTER INTEGRATED MANUFACTURING TECHNICIANS IN REGION 11.

A. Background

The choice that confronts American industry is to automate, emigrate or evaporate. Our older industries cannot hope to survive unless they automate as rapidly as they can, because their foreign competitors are doing it. If they don't, there won't be any jobs at all in those industries someday.

...Though the auto industry got a late start, it is automating in a big way. It is a high-technology industry now. It is a major purchaser of semiconductors. It is a major user of computer-aided design and computer-aided manufacturing, robotics and laser technology. The auto industry illustrates vividly the marrying of Silicon Valley with smokestack America that is so vital to our future.

The above quote was extracted from an interview with James Baker, Executive Vice President, General Electric Co. on 15 April, 1985. It graphically portrays the necessity and urgency to modernize our industries. *See attachment 3 for a more complete description of this interview.*

B. CIMT Educational Program

The application of computerized manufacturing automation and computer integration of the major functions has necessitated the development of a new post-secondary-level technical curriculum to assure that workers in modern industries have the requisite skills and knowledge. The CIMT program which has been developed by the faculty of the School of Technology, has included consideration of (1) the results of a comprehensive manpower study, (2) advice of competent representatives of manufacturing industries, (3) guidelines and information provided by the Society of Manufacturing Engineers, and (4) National criteria of quality established by the Accreditation Board of Engineering and Technology. The program is based on a "2+2" concept, which includes two years of study resulting in the award of an Associate in Applied Science (AAS) Degree. (Of course, part-time students would take longer.) Graduates of the two year associate degree program may choose to continue their studies for two additional years and earn a B.S. degree. A description of the CIMT AAS Degree program and curriculum is a part of attachment 4 of this report.

The CIM technician (2-year AAS Degree graduate) and technologist (4-year B.S. Degree graduate) are relatively new members of the manufacturing team. Specific CIMT occupational titles and qualifications have not yet been announced by the U.S. Department of Labor, but the Society of Manufacturing Engineers has developed an examination for the certification of manufacturing technicians. The Purdue AAS CIMT program graduate as well as those completing the Mechanical Engineering Technology AAS Program, have proven to be capable of passing this examination.

C. Ratios of CIMT Technicians to Other Technical Occupations.

Due to the newness and emerging nature of the CIM-technician occupation in the changing automated and computerized workplace, it has been determined by Purdue's Office of Manpower Studies, in consultation with members from manufacturing firms, that an estimate of needs can be determined by applying a "CIMT factor" (ratio) to employed engineering and related technicians who are working in a computer automation related manufacturing function. The general ratios of CIMT technicians to engineering and related technicians in the pertinent occupations are represented in Table 6.

TABLE 6

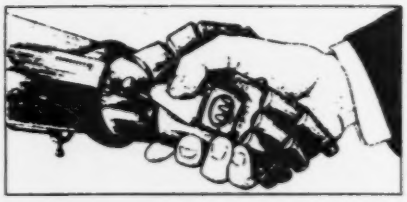
RATIOS FOR CALCULATING ANNUAL REQUIREMENTS FOR COMPUTER INTEGRATED MANUFACTURING TECHNICIANS

Technician Occupation	Ratio of Technicians Who Do CIMT-Type Tasks
Machine Tool Controllers*	1 in 2
Industrial Engineering Technician	1 in 2
Mechanical Engineering Technician	1 in 3
"Other" Engineering Technicians	1 in 5
Electrical/Electronic Engineering Technician	1 in 8
Draftsmen	1 in 10

*Includes Numerical Control, Computer Numerical Control, Direct Numerical Control, and Programmable Controller.

Results of the application of the above ratios to the pertinent technician occupations are reflected in the following section on annual recurring requirements and in Table 7.

D. Computed Annual Recurring Training Requirements for CIMT in Region 11



Applying the factors (ratios) of technicians who perform CIMT-type tasks when employed in manufacturing firms (as shown in Table 6) to the numbers of these technicians employed in Region 11 results in computed requirments to train at least 29 CIM Technicians each year. Needed in the region are 14 CIM technicians as new labor force entrants, plus upgrade training for 15 employees now in the workforce.* Of the 14 calculated new labor force entrants, 5 are due to anticipated new jobs, 3 are due to retirements or death, and 6 are due to job turnover (see Table 7).

Most of these 29 total annual training requirements are for employees of firms located in Bartholomew County (City of Columbus). Due to advancing technology and the need for manufacturing industries to modernize, it is expected this training requirement will expand over time.

*Not all of those being upgraded will seek the Associate in Applied Science CIMT degree. Some will take only selected courses to meet their specialized needs.

TABLE 7

ANNUAL RECURRING TRAINING REQUIREMENTS
FOR COMPUTER INTEGRATED MANUFACTURING TECHNICIANS IN REGION 11
WITHIN MANUFACTURING INDUSTRIES

Occupation	Employment[1] 4th Q. 1984	Employment[1] Proj. 1990	Annual Recurring Training Needs: New Labor Force Entrants* Expansion[2]	Repl[3]	Turnover[4]	Base Total	Exp to Univ[5]	Retraining Base Total[6]	Retraining Exp to Univ[5]	Exp. Grand Total
COMPUTER-INTERGR. MFG. TECH.[7]	103	132	5	3	6	14	14	14	15	29
Above CIMT data include 50% of the training requirements for Machine Tool Controllers shown below.										
Machine Tool Controller (NC, CNC, DMC, PC)[8]	52	68	3	1	3	3	7	7	8	15

*Replacement and turnover need is often met by training and promoting current employees to higher job levels. Some new hirees may already possess many of the required skills and qualifications; they may desire to enroll only in selected courses.

1/ Indiana Employment Security Division (IESD) data.

2/ IESD data: one-sixth 1990-1984 employment difference.

3/ Retirements and deaths (generally 2-3%).

4/ Based on estimated 5% (5.72% compounded) loss annually of total employment due to job turnover.

5/ Data expanded to the universe (coefficient of expansion = 1.053) because IESD data represents only approximately 95% of total employment data.

6/ Based on estimated 10% (13.42% compounded) annual need for personnel updating and retraining.

7/ Estimated by 1 of 2 machine tool controllers, 1 of 2 industrial engineer technicians, 1 of 3 mechanical engineer technicians, 1 of 5 "other engineer technicians, 1 of 8 electrical engineer technicians and 1 of 10 drafters in manufacturing only.

8/ Includes numberical control (NC), computer numerical control (CNC), direct numerical control (DNC), and programmable controlers (PC).

E. Corroborating Evidence of Need

The computed annual recurring training requirements described previously indicated a need to prepare at least 14 new CIMT technicians and to upgrade at least 15 current employees. A survey of selected manufacturing firms in Region 11 was conducted in order to determine their degree of stated interest in and need for the CIMT program under study. The survey consisted of a letter of transmittal, a description of the goals and curriculum of the program, and a fill-in-type questionnaire which asked whether they believed such a program was needed in this region, and, if so, whether or not they would send their employees for upgrade training or hire new graduates. (See Attachment 4 for copy of the survey package.) The results of the survey are presented in Table 8.

TABLE 8

MANUFACTURING FIRMS' EXPRESSIONS OF NEED FOR AND INTEREST IN CIMT PROGRAM FOR REGION 11

		Region 11 Counties			
		BARTHOL-OMEW	ALL OTHERS	SURVEY TOTALS	ANNUAL NEED
Number of Surveys Sent:.....				68	
Number of Replies:.....		24	9	33	
Do you think this program is needed to help train and upgrade personnel in manufacturing firms?	Yes	22	8	30	
	No				
	No Response	2	1	3	
Do you believe this proposed program would be successful if it was offered at the Columbus IUPUI Campus?	Yes	16	7	23	
	No				
	No Response	8	2	10	
If this program were offered, how many of your employees do you estimate would enroll in related courses during the next three years:	At Night	37+ *	14.5	51.5	17.17+ *
	By Day	5.5	3.5	9.0	3.0
	Weekends	1	4.5	5.5	1.83
	Total	43.5	22.5	66.0	22.0+
How many graduates of this program do you estimate you might hire during the next 3-year period?.....		22	10	32	10.67
	Total	65.5+	* 32.5	98	32.67+ *

* *Does not include an estimated 100+ people at Cummins Engine Co., Inc. who will need courses for upgrading and retraining via "a combination of IVY Tech, IUPUI and internal training".*

The specific numbers reported above, amounts to a potential class size of more than 30, arrived at as follows:

22+ Number of reported employees who would attend each year (see footnote in Table 8),
11 Number of CIMT graduates reported needed each year,

33+ Total number resulting from surveys.[1/]

[1/] *This total does not reflect recent high school students who might attend, nor does it include an estimate of the needs of the 214 manufacturing firms in Region 11 that did not reply to the survey.*

7. ADULT EDUCATION

Data have been presented in this report:

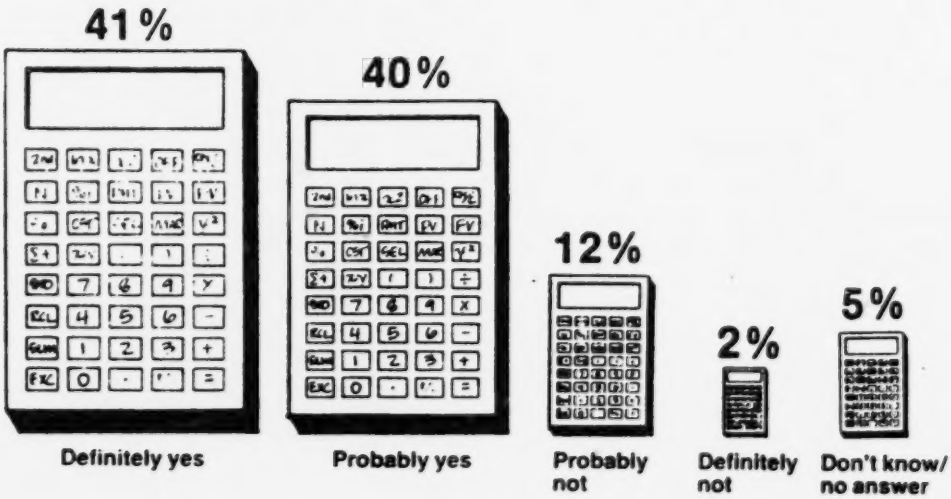
- That show that a large and growing proportion of the population projected for Region 11 will be in their middle working years (in the 35 to 49 age group).

- That compare educational attainment levels of adults and show that Region 11 adult postsecondary educational levels are well below the State and National levels.

- That reflect needs to update and retrain significant numbers of adults now in the workforce.

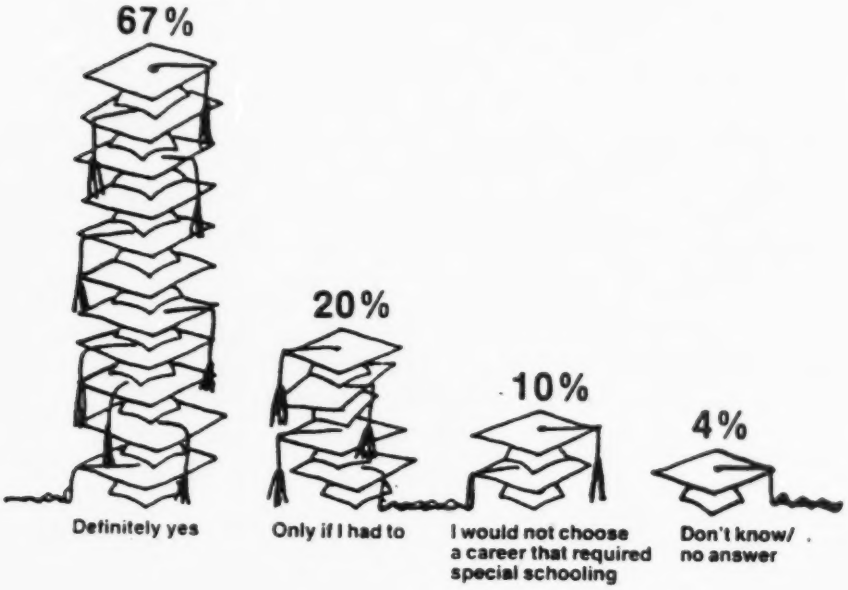
How do American working adults view the necessity for additional education or training to keep up-to-date in their job to prepare for a new one? Results of a recent survey and educational research report are shown next.

Do you think changes in the workplace will require additional career education?



More than three-quarters of the American workforce surveyed believe they do not have the skills to find, keep and grow in their jobs. Eighty-one percent said the tremendous technological changes will "definitely" or "probably" require them to get additional career education. These results are according to a recent national study by Research & Forecasts, Inc. for ITT Educational Service, Inc.

If you selected a new career that might require additional training, would you consider attending a specialized school to get that training?



NOTE: Due to rounding, the percentages do not add up to 100 percent.

There was a time when bachelor's degrees from U.S. colleges and universities provided all the training an individual needed for a career. That's no longer true and the American workers know it. Seventy-seven percent of the U.S. workforce said they would consider returning to school if their future career growth demanded it, according to The Research & Forecasts, Inc. study.

8. TECHNOLOGY INDUSTRIAL ADVISORY COMMITTEE

Previous experience has proven the usefulness of specialized industrial/educational advisory committees that are organized to include representatives from appropriate local manufacturing industries. Major activities include the following:

(a) Student recruitment, selection, counseling, and placement;
(b) Instructional program and facilities matters;
(c) Faculty professional development and assistance;
(d) Attainment of accreditation by the Accreditation Board for Engineering and Technology;
(e) Awards and public relations;
(f) Resource acquisition, including modernization of laboratory equipment;
(g) Maintaining liaison with other industry representations;
(h) Evaluation and constructive advice, and
(i) Study of future plans and training needs.

9. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

(1) Population:

There were 160,700 people living in Region 11 in 1980; by July 1, 1984 the population was 161,400, an increase of 0.4%. This is a slightly higher increase than the 0.1% for Indiana as a whole. The largest county in this region is Bartholomew with a 1980 population of 65,100, which decreased to 64,400 by 1 July 1984 (about a 1.0% decrease). The largest city in this region is Columbus with a 1980 population of 30,292. One must conclude this is a relatively stable with area with Bartholomew/Columbus being its center.

An examination of the age cohort distribution of the population reveals an actual decrease in the number of young people (24 years old and younger in particular), and a significant increase in the 35 to 49 year-old group. This has significant education and training implications.

(2) Educational Attainment.

The educational attainments of adults in Region 11 are below State averages. A higher proportion (than the National average) of adult citizens in this Region have not completed high school, and a much lower proportion have gone to college. Specifically, only 10.3 percent have one to three years of college compared with 12.1% for the State; and only 11 percent have a bachelor's or higher degree, which compares with 12.5 percent in the State. However there is a reasonably large reservoir of adults who have completed high school but have not continued their studies (42.7% in the Region vs. 41.7% for the State). One must conclude that much has to be done in Region 11 to bring adults up to State averages in postsecondary educational attainment levels, and that there is a large reservior of high school graduates.

NOTE: Previous studies have shown that (1) the local availability of needed programs, (2) offered by an institution with a good academic reputation, and (3) with low tuition rates are inducements for if local citizens to participate in post-secondary study.

(3) Work Force in Region 11.

There were more than 55,000 employees working in nearly 3,000 firms in Region 11 in early 1984. The largest concentration of employment is in Bartholomew County (City of Columbus). For example, about 24,000 people work in manufacturing firms in this Region, about 17,000 of whom work in Bartholomew. Manufacturing represents more than 43% of total employment, which is higher than the average for all Indiana counties. About 21,000 employees are found in business, service and other industry groups. Projections indicate that a slight growth in population and employment is expected in this Region. Also, there is a net in-migration of workers to Region 11. The conclusion follows that there is a relatively substantial work force employed in manufacturing industries. The types of industries include many where application of modern manufacturing methods are pertinent.

(4) National Projections of Occupational Employment Changes to 1995

The United States Department of Labor is projecting a growth of 15 percent for all occupations. However, projections for engineering technicians and technologists are double that growth. There is a continuing need to train these technical personnel throughout the forseeable future.

(5) Indiana Commission for Higher Education:

The Commission's needs and opportunities study for Southern Indiana (which includes Region 11) refers "to expand needed programming in Columbus by means of contracts with other institutions, such as Purdue programs made available through the Statewide Technology Program.... By making the Columbus Center more visibly a delivery site for programs initiated and supported by IU, and other institutions which might serve the region from this base, the Commission expects that the range and quality of services delivered at the Columbus Center can be both widened and strengthened."

In the Commission's latest Annual Report to the Governor it states "Indiana's manufacturing industries, which are hiring more and more at the technician level, are projecting that technician training will have to be upgraded to the bachelor's level within five years. Another essential educational task is the upgrading of current members of the workforce.

From these excerpts it can be concluded that the Indiana Commission for Higher Education favors expansion of needed programs in Southern Indiana and recognizes the need for more technicians who can continue their studies to the baccalaureate level.

(6) Annual Recurring Training Requirements for Computer Integrated Manufacturing Technicians (CIMT) in Region 11

A minimum annual recurring training requirement in Region 11 has been calculated to be for 29 computer integrated manufacturing technicians. At least 14 graduates are needed as new labor force entrants into all types of manufacturing industries, plus related training needs for at least 15 adults now in the workforce who need upgrade training. These training needs will grow larger over time; projections show growth rates for modern manufacturing technicians to be well above the rates for most other occupations. (See Attachments for evidence of interest and support in a CIMT program in Region 11.)

A limited survey was also conducted. Questionnaires were mailed to 68 of the 247 manufacturing firms in Region 11. There were 33 returns which reported

22+ * employees would attend CIMT courses; plus,
11 new graduates would be hired each year.

*Does not include an estimated 100+ people at Cummins Engine Co., Inc. who will need courses for upgrading and retraining via "a combination of IVY Tech, IUPUI and internal training".

NOTE: Currently, many technical courses are available on the Columbus Campus which are pertinent to the CIMT curriculum: These include computer technology; electrical, industrial and mechanical engineering technologies; mechanical drafting and design technology and supervision.

(7) Adult Continuing Education

Prime targets for postsecondary education in computer integrated manufacturing technology include adults now in the workforce who are between the ages of 25 and 49, inclusive. This conclusion is based on the fact that there is a projected increase of more than 45 percent in the 35 to 49 year age group between 1980 and the year 2000 (from 35,710 to 53,720). During this same period, there will be a sizeable decrease in the actual numbers of young people 24 years of age or younger.

In meeting these adult education needs, it will be necessary to work closely with local manufacturing firms, accommodate part-time as well as full-time students, and present courses during night-time hours (and possibly weekends) as well as the day-time.

B. Recommendations

(1) Authorization to Grant the Computer Integrated Manufacturing Technology (CIMT) Associate Degree

It is recommended that authority be granted for the IUPUI-Columbus campus to award the two-year associate degree in CIMT to students who complete all academic requirements, all of which would be offered on that campus. Necessary procedures should be established to assure that the quality of instruction and facilities meet Purdue University's Mechanical Technology Department standards.

The CIMT program at Columbus should be designed to eventually meet the (National) accreditation criteria set by the Accreditation Board for Engineering and Technology (ABET).

It is also recommended that the Purdue Statewide Technology Program structure be used to gain necessary approvals, to help obtain resources for implementation, and to administer the program once begun.

(2) Adult Continuing Education and Service Courses.

It is recommended that special plans and actions be taken to meet the CIMT training needs of adults in Region 11. Special recruitment, counseling, admission, remediation, and other activities will undoubtedly be required. Considerations should include preparing a candidate for the CIMT degree, as well as offering special courses and workshops or seminars. It is also recommended that class instruction and critical student support services be provided for both part-time and full-time students, during evening hours as well as daylight.

(3) Industrial Advisory Committee

A CIMT advisory committee should be organized, made up of qualified representatives from appropriate manufacturing industries in Region 11. Major activities for this committee should include

(a) Student recruitment, selection and placement
(b) Instructional program matters (e.g., goals, curriculum and facilities),

(c) Faculty assistance (e.g., professional development and consulting),
(d) Awards and public relations
(e) Attainment of ABET accreditation
(f) Resource acquisition
(g) Liaison maintenance with other industry representatives, and
(h) Development of future plans.

(4) Indiana Commission for Higher Education Recommendations:

The recommendations to offer the complete curriculum for the two-year associate degree in CIMT at IUPUI-Columbus, and to award the degree to students who complete all requirements, are consistent with the findings and recommendations of the Commission. It is recommended that this fact be taken into consideration by review and approval-granting authorities.

(5) Liaison with Local Junior and Senior High Schools

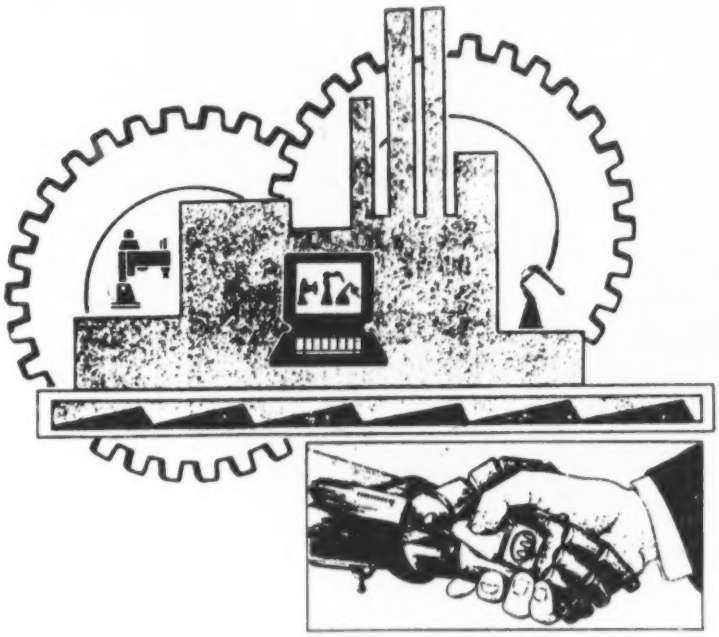
Finally, it is also recommended that close liaison be established with local junior and senior high schools in matters pertaining to engineering technology related to academic and career counseling, academic preparation, and program availability.

Computer-Integrated Manufacturing (CIM) is of major interest to manufacturing and process industry customers, because of its potential to provide solutions to a number of major business concerns facing them today. These concerns can affect all functional areas of a business from product engineering and design, business and product planning, to plant operations.

A major concern in today's worldwide competitive environment is business survival... in which manufacturing cost and responsiveness to change are crucial. New technologies are transforming manufacturing companies throughout the world. As companies streamline their operations and change from traditional ways of doing business, CIM offers new opportunities for business growth and the growth of people.

Business goals in this new CIM environment can be summarized as:

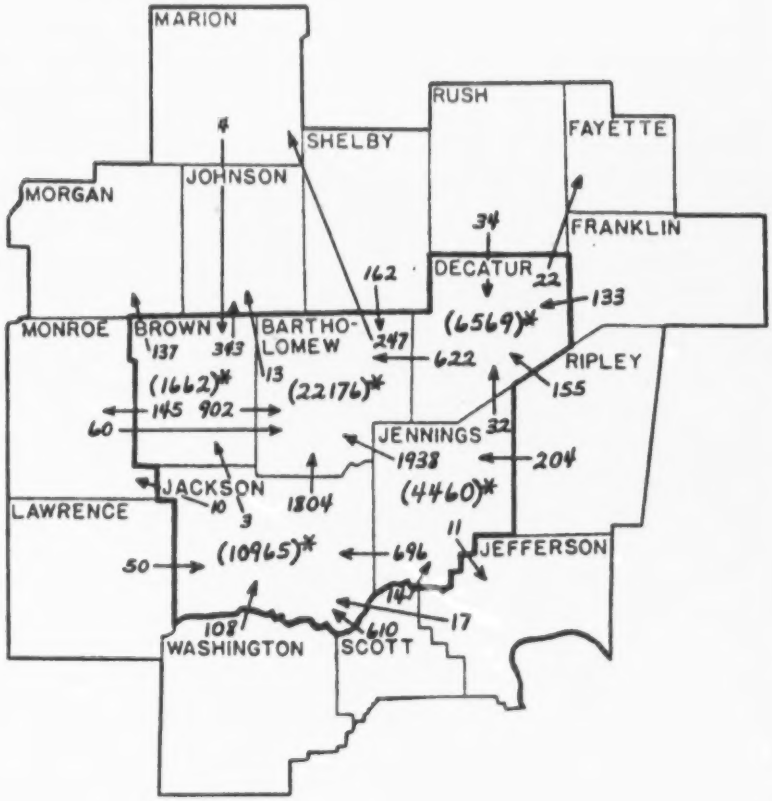
- Improving product quality against world-wide competition
- Reducing manufacturing cost by improving productivity of production machines, materials and people
- Greater responsiveness to changes in customers' requirements by being more flexible to change in plant operations



IBM Computer-Integrated Manufacturing Pamplet

ATTACHMENT I
REGION 11
WORKING PATTERNS
(1980)

Within Region 11, more than 53,000 adults lived and worked, according to the 1980 Census. There also existed a net in-migration of more than 600 workers. Of the Region 11 resident workers, 42 percent were in Bartholomew County, which thus serves as the employment center for the region. Bartholomew County also had a net in-migration of more than 5000 workers, drawing workers from the other counties in Region 11. Thus, if Bartholomew County were not in Region 11, the region would have a net out-migration of nearly 6000 workers. Moreover, of significant importance is the finding that Bartholomew County had a net out-migration of only 247 workers to Marion County (Indianapolis area).



Workers 16 years & over living in the county.

REGION 11

Living & Working.....53229
Migration In...1551
Migration Out.. 928
Net Migration (In)... 623

BARTHOLOMEW COUNTY

Living & Working.....22176
Migration In...5488
Migration Out.. 260
Net Migration (In).... 5228

JACKSON COUNTY

Living & Working.....10965
Migration In...1481
Migration Out..1817
Net Migration (Out)... 336

DECATUR COUNTY

Living & Working.....6569
Migration In...354
Migration Out..644
Net Migration (Out)... 290

JENNINGS COUNTY

Living & Working.....4460
Migration In... 218
Migration Out..2967
Net Migration (Out)...2749

BROWN COUNTY

Living & Working.....1662
Migration In... 7
Migration Out..1527
Net Migration (Out)...1520

SOURCE: *Census of Population and Housing, 1980: Supplement 1--Tabulation PB34, Place of Work, Washington, D.C.: Bureau of the Census, 1983.*

ATTACHMENT 2

SELECTED OCCUPATIONAL EMPLOYMENT CHANGES
Projected from 1984 to 1995. (National Data)*

According to recent projections of the Bureau of Labor Statistics, there are significant growth trend differences for many occupations. For comparable data for 450 occupations, see Office of Manpower Studies Tid-bit 86-1, 31 Jan. 1986.

	Employment		% Change
	1984	1995	1984-95
	(#'s in thousands)		
●All Occupations	106,843	122,760	15%
●Agriculture (All types)	3,554	3,447	- 3%
●Computer Specialists			
Systems Analysts	308	520	69%
Computer Programmers	341	586	72%
Data Process, Equip., Repair	50	74	56%
●Engineers (All types)	1,331	1,811	36%
Aero & Astro	48	62	30%
Chemical	56	69	24%
Civil	175	222	27%
Electrical & Electronic	390	597	53%
Industrial	125	162	29%
Mechanical	237	317	34%
●Engineering Technicians & Technologists			
Civil	71	74	28%
Electrical & Electronic	404	607	50%
Industrial	27	34	26%
Mechanical	55	75	37%
Drafters	345	384	11%
●Health Related			
Dietician and Nutritionist	48	60	26%
Medical Lab & Clinic. Tech	236	254	7%
Pharmacist	151	166	10%
Physician and Surgeon	476	585	23%
Registered Nurse	1,377	1,829	33%
Veterinarian	40	48	22%
●Scientists			
Biological	54	64	17%
Chemical	85	94	10%
Mathematics	51	63	23%
●Social Workers	335	410	22%
●Teachers			
Kindergarten & Elementary	1,381	1,662	20%
Secondary School	1,045	1,093	5%
College & Univ. Faculty	731	654	- 11%
●Miscellaneous			
Accountant	882	1,189	35%
Economist	38	45	19%
Food Serv. & Lodg. Mgr	657	746	14%
Psychologist	97	118	22%

* SOURCE: *MONTHLY LABOR REVIEW, November 1985, U.S. Department of Labor, Bureau of Labor Statistics, Washington, D.C. 20212.*

ATTACHMENT 3
Reprinted from

U.S. News & World Report

General Electric's Executive Vice President James Baker will be joined by Calma President Dan McGlaughlin on the ASEE SE Section-sponsored Satellite Program on CAD/CAM.
APRIL 15, 1985 2:30 - 4:00 PM EST

Interview With James Baker, Executive Vice President, General Electric Company

Industry Must "Automate, Emigrate or Evaporate"

Switching to high technology will cause loss of jobs and income, but American businesses really have no choice if they want to compete with foreign firms.

Q Mr. Baker, how will advanced high technology affect our economic future?

A The choice that confronts American industry is to automate, emigrate or evaporate. Our older industries cannot hope to survive unless they automate as rapidly as they can, because their foreign competitors are doing it. If they don't, there won't be any jobs at all in those industries someday.

Q So you do see a future for our older industries, such as autos and steel, if they automate?

A Yes. Though the auto industry got a late start, it is automating in a big way. It is a high-technology industry now. It is a major purchaser of semiconductors. It is a major user of computer-aided design and computer-aided manufacturing, robotics and laser technology. The auto industry illustrates vividly the marrying of Silicon Valley with smokestack America that is so vital to our future.

We will surely have a specialty-steel industry. Inland Steel is making money in steel. It should continue to be a viable steel company. Bethlehem and Jones & Laughlin are automating and should do well. Others will survive but will be smaller. Some won't survive. Though U.S. Steel's management no longer seems to be focused completely on steel, the company's new automated pipe mill in Alabama encourages me that it is still serious about steel, too.

Q How will automation affect jobs?

A If it were to happen in a short period of time—10 to 15 years—that would mean a tremendous loss of jobs. But the transition will be much more gradual. Many individual robots will be put into operation, but the big, full-factory-automation jobs won't be done quickly. The buying of what I call "factories with a future" is about 3 percent of total business plant-and-equipment purchases today. I expect that to rise to about 16 percent by 1990.

Q Still, some jobs will be lost—

A You're seeing that happen now. Neither steel nor autos is hiring back all the workers laid off during the recession. To work again, those not recalled will have to take different and probably lower-paying jobs elsewhere. They will need new skills, but many won't look for or train for new jobs as long as they feel they have recall rights. This attitude needs to be changed. Instead of saying to workers, "You are laid off indefinitely," perhaps they should be told, "You are laid off permanently." Then they can prepare for new careers instead of waiting for nothing.

Q Will the number of jobs created in the high-technology industries make up for the number of jobs lost elsewhere?

A Not as we know those high-tech industries today. The number of jobs being created in the semiconductor and electronics industries—the so-called Silicon Valley industries—do not nearly equal the number of jobs being displaced in the smokestack industries. But nobody knows what new industries, with how many new jobs, will be created in the future.

Q Will the jobs in the new industries pay as well?

A Nobody knows that for sure, either. It's true that a displaced steel or auto worker who takes a job in the electronics industry probably will lose money. So will an engineer or other white-collar worker. When GE bought its two acquisitions in Silicon Valley, we found that employes, across the board, were earning about 15 percent less than average wages for companies in the Midwest and East.

Q So, in the short run, many people will lose income?

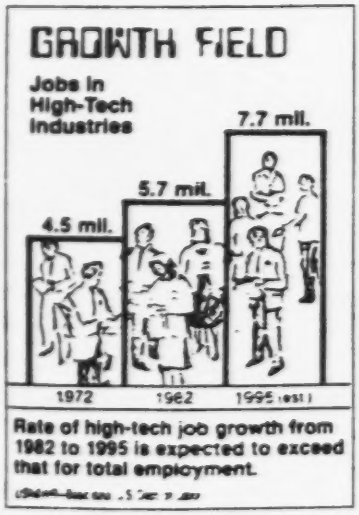
A Yes, many blue and white-collar workers are going to make less money. But when a man makes less money, his wife often goes to work to preserve their standard of living. I think you'll see virtually every family with two people working to buy that car and that house.

Q What will it mean for young people?

A They're going to have to be much better educated and in different ways. In Florence, S.C., where GE has a plant, the high school allows a student the choice of preparing for college or using his or her final two years to learn electronics, computer programing, robot repair, interactive graphics—something of value in the real world of work.

Q On balance, then, you see automation as a blessing?

A It's the salvation of our economic system.



Rate of high-tech job growth from 1982 to 1995 is expected to exceed that for total employment.

BEST COPY AVAILABLE

ATTACHMENT 4

IUPUI COLUMBUS
2080 Bakalar Drive
Columbus, IN 47201

February , 1986

Letter To
Area Manufacturing Firms

Dear_____ :

Your need to apply advancing technology to the manufacturing process in order to remain competitive and to grow was one of the reasons for the expansion of programs and facilities at IUPUI Columbus. Your need for specially-trained technical personnel and the necessity of retraining employees require the University in Columbus to change with you.

Preliminary studies indicate that this Region composed of Bartholomew, Brown, Decatur, Jackson, and Jennings counties could benefit from a two-year Associate in Applied Science degree program in Computer-Integrated Manufacturing Technology (CIMT). This Purdue University program would be designed to meet the stringent technical and academic criteria established by the Accreditation Board of Engineering and Technology (ABET). Achievement of ABET accreditation amounts to national recognition of excellence in engineering and technology programs. Graduates of this associate degree would be able to continue their studies to earn an appropriate bachelor of science degree.

Your interest and support for this program must be confirmed, if it is to be offered at IUPUI Columbus. Please help us to serve you better by reading the description of the proposed program and then completing and returning the one-page questionnaire.

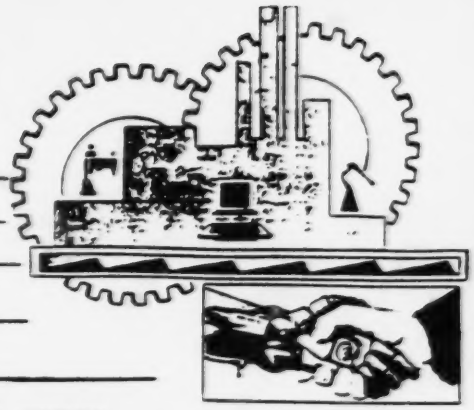
The CIMT program has been successfully implemented at the Purdue West Lafayette campus. If there is sufficient need, interest, and support in this Region, this program could be offered here. Your response will be helpful in determining what further actions we should take. Please feel free to call me if you have questions.

Sincerely yours,

Paul R. Bippen
Director

Attachments: Program Description
Questionnaire
Return Envelope

PRB:es



Your Name _____ Firm _____

Your Title _____ Address _____

Number of employees _____

SURVEY QUESTIONS TO DETERMINE THE NEEDS FOR AN ASSOCIATE DEGREE PROGRAM IN COMPUTER-INTEGRATED MANUFACTURING TECHNOLOGY

The following questions ask you to identify your needs (if any) for graduates from this program, and whether some of your current employees would attend for retraining or upgrading purposes. Courses may be taken by full or part-time students. About 62 semester hours are required to earn the degree (this would take two years for full-time students). Graduates would receive a Purdue degree and may continue their studies to earn an appropriate bachelor's degree.

Please look over the description of the proposed CIMT Associate Degree Program, then answer the questions. If you have no needs for graduates from this program, or for training your employees, please so indicate and return the questionnaire. Your answers will be held strictly confidential.

1. Do you think this program is needed to help train and upgrade personnel in manufacturing firms? Yes___ No___

2. Do you believe this proposed program would be successful if it was offered at the Columbus IUPUI Campus? Yes___ No___

3. If this program were offered, how many of your employees do you estimate would enroll in related courses during the next three years:
   _____ at night
   _____ by day
   _____ weekends

4. How many graduates of this program do you estimate you might hire during the next 3-year period? Number _____

5. Comments or suggestions concerning the proposed program: _____

_____

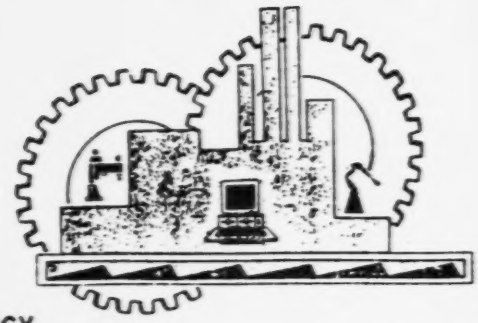
_____

_____

Thank you for completing this form. Please return to:

Dr. Paul R. Bippen
Director, IUPUI Columbus
2080 Bakalar Drive
Columbus, IN 47201

ATTACHMENT



DESCRIPTION OF A TYPICAL 2 YEAR ASSOCIATE IN APPLIED SCIENCE (AAS) DEGREE PROGRAM IN COMPUTER INTEGRATED MANUFACTURING TECHNOLOGY

Computer Integrated Manufacturing Technology (CIMT) is a new program in the School of Technology at Purdue University. Designed to train specialists in modern plant manufacturing, the program addresses the specialized needs of automated and computerized manufacturing systems. Comprehensive in scope, such systems provide computer assistance to all related functions including marketing, product design, production, and shipment.

In response to the unique and timely needs of modern industry and with the advice of manufacturing engineers, the curriculum focuses on computer-aided design and drafting (CADD), computer-aided manufacturing (CAM), robotics, flexible manufacturing, and numerical control. At the heart of this innovative program lies a strong, traditional manufacturing core, similar in nature to the proven and highly respected mechanical engineering technology program. The balance between the traditional and the innovative insures a technical education responsive to industry's changing needs.

The CIMT curriculum offers students a "2+2" option. Job ready at the completion of the associate degree program (typically 2 years of full-time study), students may elect to enter the job market as skilled technicians or may choose to continue their studies in pursuit of the bachelor of science degree in Technology. Many students do both -- they work part-time and go to school part-time. Courses may be taken by recent high school graduates preparing for a career, or for upgrade or retraining by adults now in the workforce.

To earn the AAS degree in CIMT, each student must complete a total of 66 credit hours from three specified categories: science, technical, and non-technical. These are described briefly on the next page.

OVER

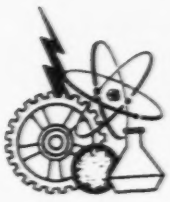
NOTE: *You may keep this program description, but return only your completed questionnaire.*

CIMT CURRICULUM DESCRIPTION

The AAS degree in CIMT is made up of a total of 66 semester hours in three categories: (1) Science (19 credit hours), (2) Specialized and Technical (38 credit hours), and (3) Non-technical (9 credit hours). The titles of these courses are identified below:

SCIENCE (19 Credit Hours)

Credit Hrs.	Course Title
5	Algebra/Trigonometry
3	Calculus for Technology
3	Elementary Statistics
8	General Physics I & II



SPECIALIZED AND TECHNICAL (38 Credit Hours)

Credit Hrs.	Course Title
6	Materials and Processes I & II
3	Manufacturing Processes
3	Automated Manufacturing Processes
3	Applications of Engineering Mechanics
3	Fluid Power
2	Applied Engineering Computations
3	Electricity Fundamentals
3	Electronics and Industrial Controls
3	Drafting Fundamentals
3	Production Drawing
3	Computer Fundamentals & Programming for Technology
3	Software Concepts & Hardware Organization

NON-TECHNICAL (9 Credit Hours)

Credit Hrs.	Course Title
3	Fundamentals of Speech Communication
3	English Composition
3	Social Science Elective

NOTE: The above are all University courses and successful completion of each is applicable to an appropriate Bachelor of Science Degree.

ATTACHMENT 5

LETTERS AND COMMENTS OF INTEREST AND SUPPORT FOR THE CIMT PROGRAM IN REGION 11

K. S. Chui; Chairman, CIMT Advisory Committee,
IUPUI - Columbus. Cummins Engine Company, Inc.

J. H. Schlensker; Vice President - Columbus Operations
Technical Superintendent. Cummins Engine Company, Inc.

Roy B. Schwartzkopf; Vice President-Manufacturing.
Cosco Inc.

* * *

Comments taken from CIMT survey questionnaire responses:

COSCO, INC.

ESSEX CASTINGS, INC.

KALTENBACH INC.

CUNNINGHAM PATTERN & ENGINEERING, INC.

NORTH AMERICAN AUTOMOTIVE, Div. of
Arvin Industries, Inc.

Cummins Engine Company, Inc.
Box 3005
Columbus, Indiana
47202-3005

ATTACHMENT 5 (CONTINUED)

April 24, 1986

Dr. Paul R. Bippen, Director
IUPUI-Columbus
2080 Bakalar Drive
Columbus, Indiana 47203

Dear Paul,

As Chairman of the CIMT Advisory Committee, I have communicated with engineering/technical friends of mine from various local industries such as Reliance Electric, Arvin Industries, Cosco Co., etc., to seek their inputs on the CIMT program at IUPUI-Columbus.

Most of the feedbacks indicated that there exist strong needs locally for the skills and knowledge that a CIMT program can provide, and that an associate CIMT program will be a very desirable and practical means to meet such needs.

I shall be most delighted to go over some of the benefits and supporting comments with you in detail. But for now, I am writing to let you know that a CIMT associate program at Columbus is perceived to be a very welcome program. I therefore, as Chairman of the CIMT Advisory Committee, recommend that we should continue to direct our effort to the development of such curriculum.

K. S. Chui
Chairman
CIMT Advisory Committee
IUPUI-Columbus

KSC:tc

CIMT ADVISORY COMMITTEE MEMBERS:

Ken Greenlee; *Director-Manufacturing Process Development*; Cummins Engine Company
Roy Schwartzkopf; *Vice President-Manufacturing*; Cosco, Inc.
John Sohn; *Corporate Vice President*; Arvin Industries
Owen Gall; *President*; Hartrup Tool, Inc.
David Flohr; *Vice President*; Product Engineering, Inc.
Maurice Howard; *Plant Engineer*; Reliance Electric
Russ Merritt; *Plant Engineer*; Reliance Electric

Phone: 812-377-5000

Cummins Engine Company, Inc.
Box 3005
Columbus, Indiana
47202-3005

ATTACHMENT 5 (CONTINUED)

April 23, 1986

Dr. Paul Bippen
Vice President
Columbus Campus, I.U.P.U.I.
2080 Bakalar Drive
Columbus, Indiana 47203

Dear Dr. Bippen:

We are very impressed with the new proposed CIMT program. The curriculum looks excellent. The importance of these technologies to the Southern Indiana Area cannot be overstated. We see improved skills in these technologies as necessary to keeping the manufacturing industries in the area competitive in world markets and providing for the development of new manufacturing businesses.

Within Cummins we do not expect to add a significant number of new employees during the next several years. However, we do have significant retraining needs. Over the next few years, we will need to upgrade and provide retraining for 100 plus people with many of the skills and technologies proposed in the CIMT program. We will be looking at a combination of IVY Tech, IUPUI and internal training to provide this effort.

We look forward to working with you to provide support for our skills development needs.

Sincerely,

J.H.Schlensker:dc
Mail Code: 10120
812-377-5187

Vice President - Columbus
Operations Technical Supt.

(Please note change in internal mail code and telephone number.)

Phone: 812-377-5000

COSCO INC.

2525 State Street
Columbus, IN 47201
812-372-0141

April 24, 1986

Mr. Paul Bippen
IUPUI Columbus
2080 Bakalar Drive
Columbus, IN 47203

Dear Paul:

It would be a real plus to Cosco and all local industry to have the Computer Integrated Manufacturers program available through IUPUI. I would certainly support the program.

Even for a non-tech industry such as Cosco, it is becoming evident that computer aided manufacturing is a must. Cosco would use your program to train new and current employees.

Sincerely,

Roy B. Schwartzkopf
Vice President - Manufacturing

RBS:ch

"Interest will continue growing for the program."
-- COSCO, INC.; COLUMBUS

"Sounds like a very good program..."
-- ESSEX CASTINGS, INC.; COLUMBUS

"I have reviewed the program description with the appropriate employees and everyone is impressed."
-- KALTENBACH INC.; COLUMBUS

"I'm happy to see this kind of program."
-- CUNNINGHAM PATTERN & ENGINEERING, INC.; COLUMBUS

"Looks good and what is needed in the area if business and industry plans to: keep what they have and improve on technology for future existence."
-- NORTH AMERICAN AUTOMOTIVE,
DIV. OF ARVIN INDUSTRIES, INC.; NORTH VERNON